Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
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IN RE: DELETE, DELETE, DELETE	)	GN Docket No. 25-133
	)	
	)	

COMMENTS BY THE AMATEUR RADIO SAFETY FOUNDATION, INC. RELATED TO THE REQUEST FOR PUBLIC INPUT ON ALLEVIATING UNNECESSARY REGULATORY BURDENS

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Comments of ARSFI, the Amateur Radio Safety Foundation, Inc.

ARSFI, the Amateur Radio Safety Foundation, Inc., d/b/a/ Winlink Global Radio Email®, submits these comments on alleviating unnecessary regulatory burdens as requested in FCC General Docket No. 25-133.

Summary

47 CFR § 97.221(b)[1] of the Commission's rules unduly and severely restricts the spectrum available for automatically controlled digital stations (ACDS) using modern data transfer protocols, which were not in existence when § 97.221(b) was established. Some of these modern protocols require even greater amounts of spectrum. Thus, the spectrum restrictions imposed by § 97.221(b) are an impediment to the further development in the U.S. of state-of-the-art radio message systems used in the amateur service as well as the fixed service for emergency communications. This rule should be eliminated or modified to provide sufficient spectrum for ACDS operation.

A principal user of the spectrum governed by § 97.221(b) is the Winlink radio email system, which comprises geographically dispersed radio email servers and end-user nodes designed to send and receive multiple-recipient email messages with attachments by radio, and to continue operating even when normal telecommunications networks are overloaded or inoperative. Winlink has a mode of operation which can function in the absence of commercial infrastructure. Winlink uses HF radio frequencies to provide an emergency alternative to the conventional Internet backhaul circuits that carry email. Winlink also has the capability to move email between radio users without depending on email servers or any other infrastructure. Like standard email, Winlink can deliver messages to multiple email and/or radio recipients in a single message, saving much time and occupied bandwidth. Winlink software was developed, and continues to evolve,

[1] https://www.ecfr.gov/current/title-47/section-97.221

mainly in the amateur service. Of several radio services utilizing the Winlink system, the amateur service is the largest user, in which it is relied upon for backup emergency communications for state and local government Primary, Alternate, Contingency, and Emergency (PACE) communication plans, and other important users such as hospitals, the American Red Cross, and other non-governmental relief organizations and critical infrastructure. It is also used in the fixed service, including use by the U.S. Department of Homeland Security (DHS) Cybersecurity and Infrastructure Security Agency (CISA) in their SHAred RESources (SHARES) High Frequency Radio Program[2] for emergency communications.

Winlink network nodes operate without human intervention to find a clear frequency, route, store, and forward the email, using the internet standards for email. Radio email may be addressed either by its normal Internet email address or by radio station call sign. On the amateur radio bands, FCC rule § 97.221(b) requires all users of ACDS to share tiny ranges of frequencies (sub-bands), creating contention for the spectrum among existing users and making it impractical for innovators to develop new technologies – all while significant adjacent spectrum lies fallow. Instead of promoting "Continuation and extension of the amateur's proven ability to contribute to the advancement of the radio art."[3], one of the Commission's stated purposes of the amateur service, § 97.221(b) is a significant impediment to this purpose.

Qualifications of Commentor

The Amateur Radio Safety Foundation, Inc.is a non-profit organization formed for the purpose of funding and running the Winlink Global Radio Email Network System, now used for amateur radio, the DHS CISA Shared Resources HF Radio Program, and other government services. The Board of Directors for this

[2] https://www.cisa.gov/resources-tools/programs/shared-resources-shares-high-frequency-hf-radio-program
[3] https://www.ecfr.gov/current/title-47/section-97.1

organization comprises a distinguished group of engineers, electronics experts, internet pioneers, and emergency communications professionals.[4]

Discussion

Today, the Winlink Radio Email System, an automated store-and-forward digital radio system which dominates digital communications for data transfer over amateur radio spectrum worldwide, is a critical component of PACE communication plans for many states, counties, non-governmental relief organizations, and critical infrastructure. Interoperability with Internet email is a critical capability of Winlink for support of Continuity of Operations (COOP) communications for all federal agencies through the DHS CISA SHARES[5] HF Radio Program.

Because the Commission is committed to eliminating rules and regulations that are no longer necessary and that impede innovation, we respond to this request for comments as it pertains to the section of the Commission's rules that regulate automatically controlled digital stations (ACDS), 47 CFR § 97.221(b)[6].

This rule has been in effect since July 1,1995, at which time it was adequate for the development of the radio art and active operation of automated message systems. However, this regulation was enacted prior to the adoption of wider-bandwidth, higher speed digital protocols used today for data transfer over

[4] Scott Dakers, currently Washington State Emergency Management Division, Disaster Emergency Communications Lead; Tom Lafleur, retired VP, Corporate IT, Telecommunications, Engineering, and Business Development, Qualcomm; Phil Sherrod, Senior Software Developer of operating systems, language compilers, predictive modeling software; Ross Merlin, former DHS CISA Shared Resources (SHARES) Program Manager, author of the DHS National Interoperability Field Operations Guide (NIFOG), and former DHS Spectrum Manager; Steve Waterman, retired VP, Telco Research Corporation; network design/consulting/software development, co-author of the Winlink Hybrid Radio Email Network System; Chris Steinhardt, Attorney at Law; Rick Muething, engineer of high-tech military electronics and semiconductor test equipment; Lee Inman, USAF electronics instructor, retired; and Loring Kutchins, retired VP of Dynamic Solutions, Inc., retired VP of Millipore Corporation Dynamic Solutions Division, entrepreneur of successful computer- and laboratory oriented startups, software developer and marketer.

[5] SHAred RESources HF Radio Program, originally a function of the National Communications System (NCS), later transferred to DHS. See 47 CFR 216 https://www.ecfr.gov/current/title-47/chapter-II/part-216?toc=1 and its appendix https://www.ecfr.gov/current/title-47/chapter-II/part-216/appendix-Appendix%20to%20Part%20216

[6] https://www.ecfr.gov/current/title-47/section-97.221, *included at page 7.*

the HF radio spectrum, and before the widespread availability of software modems (modems implemented in computer soundcards instead of expensive hardware). The rule predates the shift of all communication methods – including amateur radio – from analog to digital protocols.

Specifically, in 1995 the only modes of digital communications generally used in the amateur service were RTTY (radioteletype) and AMTOR (amateur teleprinting over radio). Since then, other digital modes were developed which decreased the cost of the necessary equipment and reduced the time it takes to transmit ever more data – capabilities that are critical during emergency communications. Table 1 provides a comparison of occupied bandwidth and speed by mode, in the order by which they entered service.

Protocol	Bandwidth	Speed[7] (max)	Mode	Year Introduced
Baudot RTTY	≈ 0.250 kHz	45.45 bps	FSK, AFSK	1922
AMTOR	≈ 0.200 kHz	112bps	FSK	1978
PACTOR I	≈ 0.500 kHz	200 bps	FSK	1991
PACTOR II	≈ 0.500 kHz	800 bps	PSK	1992
CLOVER	≈ 0.500 kHz	750 bps	Multi-tone FSK	1995
PACTOR III	≈ 2.4 kHz	3600 bps	OFDM	2005
PACTOR IV	≈ 2.4 kHz	5512 bps	Adaptive PSK	2011[8]
VARA HF narrow	≈ 0.500 kHz	1543 bps	OFDM	2011
VARA HF standard	≈ 2.3 kHz	7050 bps	OFDM	2011
VARA HF tactical	≈2.75 kHz	8489bps	OFDM	2017

TABLE 1 - COMPARISON OF OCCUPIED BANDWIDTH AND SPEED BY MODE

The mid-1990s was the dawn of Internet email, which exploded with the growth of the worldwide web and the advent of commercial Internet service providers (ISPs), when Simple Mail Transfer Protocol (SMTP) became the *de facto* standard for email transmission. When § 97.221(b) was enacted, the dominant digital mode was AMTOR, a variant of SITOR (simplex teletype over radio), a mode then commonly used by commercial ship-to-shore maritime common carriers. AMTOR had a maximum throughput speed of 112 bps (bits per

[7] Uncompressed data

[8] Not authorized for use in the U.S. until 2024.

second) and occupied approximately 200 Hz of radio spectrum. Soon thereafter, the Clover protocol was introduced with a maximum throughput of 750 bps and an occupied bandwidth of 500 Hz. Today, for maximum throughput the PACTOR IV and VARA HF modes use signals that occupy from 2.3 kHz to 2.75 kHz and achieve compressed[9] data rates of 10,500 bps to 16,129 bps. This allows for much more practical amounts of binary data to be sent and received quickly, making such transfers practical for use on HF, especially in emergencies when responding to authorities looking for geographic situational awareness - "ground truth." While the reasoning for § 97.221(b) was adequate for that period, this was prior to anyone in amateur radio attempting to integrate the terrestrial Internet email system with radio using modern digital data transfer protocols as a transport medium. It was the Winlink Development Team that first provided this capability for the amateur service, which was immediately reviewed and deemed legal in accordance with Part 97 rules.

47 CFR § 97.221(b) impacts emergency communications, particularly in times of crisis, by creating contention for spectrum where ACDS may operate. Its importance has been further amplified by the expanding involvement of volunteer operators and organized groups working alongside emergency agencies at all levels. See Appendix A for depictions of Winlink ACDS utilization following Hurricanes Helene and Milton. These groups provide resilient communication pathways for systems using ACDS to link the terrestrial Internet with the radio Internet, bringing valuable situational awareness data and urgent messages to emergency decision makers. See "A Failure of Initiative, Final Report of the Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina",[10] which states in one of its conclusions "officials need to take the initiative to make responsible use of federal, state and local funding to **develop communications systems that can grow** with their communities." For this growth to occur, there must be sufficient radio spectrum available. See Appendix B for the comments of the National Coordinating Center for Communications about

[9] https://winlink.org/B2F

[10] https://www.congress.gov/109/crpt/hrpt377/CRPT-109hrpt377.pdf, pp. 177-178

technology development in the amateur service which improves communications in other services.

Today, because § 97.221(b) limits ACDS utilizing digital technologies to a mere 3.8% of the amateur service HF spectrum[11], or 13.4% of the spectrum allowed for amateur service HF digital communications[12]. Because the 17, 15, 12, and 10 meter bands are of limited utility for Winlink message forwarding[13], the percentages are distorted particularly by the large ACDS sub-band at 10 meters. Considering only the 80 through 20 meter bands illustrates that there is a mere 46 kHz for ACDS out of 667 kHz for digital modes, or 6.9%, which better represents the proportion of usable ACDS spectrum.

The most widely used digital transfer protocols worldwide for amateur HF data transmission are PACTOR III, PACTOR IV, and VARA HF—all developed outside the United States. In contrast, ARDOP (amateur radio digital open protocol), which was developed in the U.S. in 2015 by the Winlink team lead by Rick Muething, pioneered the use of Orthogonal Frequency-Division Multiplexing (OFDM) protocols that utilize computer software and affordable sound cards to achieve higher data throughput. ARDOP, based on SCAMP (Sound Card Amateur Message Protocol) in 2004 and WINMOR in 2008, paved the way for faster, more robust sound card data transfer applications. ARDOP was among the first to leverage inexpensive software and personal computer sound cards for data transfer. While ARDOP, like PACTOR and VARA HF, is capable of sending data to multiple radio and SMTP recipients simultaneously in a single message, the limited spectrum available under § 97.221(b) has hindered continued development. The bandwidth constraints discouraged the developer from advancing ARDOP further. For many years PACTOR III and PACTOR IV (developed in Germany) dominated ACDS message systems, but due to the expensive proprietary hardware modem required there existed an opportunity for

[11] 135 kHz of 3550 kHz
[12] 135 kHz of 1007 kHz
[13] Long-distance propagation during daytime, and no skywave propagation during nighttime, are characteristics of these bands which limit their utility for continental U.S. coverage of message forwarding systems.

innovation. Consequently, the more recent and faster VARA HF protocol, developed in Spain, has become the dominant digital protocol used worldwide.

Accordingly, the most widely utilized adaptive data transfer protocols (PACTOR IV and VARA HF) were developed outside the United States. We believe that the severe limitations on available bandwidth imposed by § 97.221(b) has hindered the growth and development of these critical technologies within the U.S.

Proposed Solutions

For convenience we include § 97.221 as it currently exists:

§ 97.221 Automatically controlled digital station.

(a) This rule section does not apply to an auxiliary station, a beacon station, a repeater station, an earth station, a space station, or a space telecommand station.

(b) A station may be automatically controlled while transmitting a RTTY or data emission on the 6 m or shorter wavelength bands, and on the 28.120-28.189 MHz, 24.925-24.930 MHz, 21.090-21.100 MHz, 18.105-18.110 MHz, 14.0950-14.0995 MHz, 14.1005-14.112 MHz, 10.140-10.150 MHz, 7.100-7.105 MHz, or 3.585-3.600 MHz segments.

(c) Except for channels specified in § 97.303(h), a station may be automatically controlled while transmitting a RTTY or data emission on any other frequency authorized for such emission types provided that:

(1) The station is responding to interrogation by a station under local or remote control; and

(2) No transmission from the automatically controlled station occupies a bandwidth of more than 500 Hz.

We now offer three possible solutions to this problem:

1) **Delete § 97.221 in its entirety.** Licensees in the amateur service have a long-standing tradition of choosing operating frequencies in accordance with voluntary band plans. To this point, the Commission stated in its Report and Order and Further Notice of Proposed Rulemaking in WT Docket No. 16-239, at 16[14]:

> Our [the Commission's] approach encourages experimentation and innovation, and permits the use of existing technologies available in other

[14] https://docs.fcc.gov/public/attachments/FCC-23-93A1.pdf

> services. Moreover, we note that ARRL maintains a voluntary band plan that outlines suggested portions of the bands for certain applications as well as specifies limitations contained in our rules. We find that a community-driven, voluntary band plan that can rapidly be adjusted as technology changes and is consistent with our rules requiring cooperation and efficiency is preferrable to a FCC rule-based mandatory band plan that requires regulatory action to adjust. Thus, we decline to adopt a mandatory band plan here.

ARSFI can enforce compliance with voluntary band plans by automatically controlled digital stations using Winlink, by denying them access to the Winlink servers if their operation does not conform. However, ARSFI cannot enforce band plan compliance on stations using Winlink for peer-to-peer communications (transmissions between two stations not utilizing a Winlink gateway station), nor can ARSFI exert any control on stations using other digital protocols.

Protection of non-amateur stations required by § 97.303(h)[15] remains the responsibility of the transmitting station even without this rule and can be achieved by using listen-before-transmitting techniques available in some modern modems.

We anticipate that this would be too far-reaching a change for the amateur community, who would insist upon protection for certain modes and band segments.

2) **Change the proportion of each band allocated for digital versus phone (voice) modes of operation and expand the amount of spectrum available for ACDS.** Prior to 2006, the 80 meter band was divided at 3750 kHz – from 3500 to 3700 kHz digital modes were allowed, and from 3700 to 4000 kHz voice ("phone") was allowed.[16] In 2006, the Commission moved the dividing line to 3600 kHz. This changed the digital segment from one-half of the band to one-fifth. The dividing line between digital and phone sub-bands for other HF bands also changed. In mid-2017, a new digital mode called FT8 was introduced and by the end of that year, approximately 60% of amateur radio

[15] https://www.ecfr.gov/current/title-47/section-97.303

[16] For simplicity, we are omitting the use of CW throughout the entire band, and omitting image modes in the phone segment.

contacts were made using a digital mode – see Figure 1.[17]

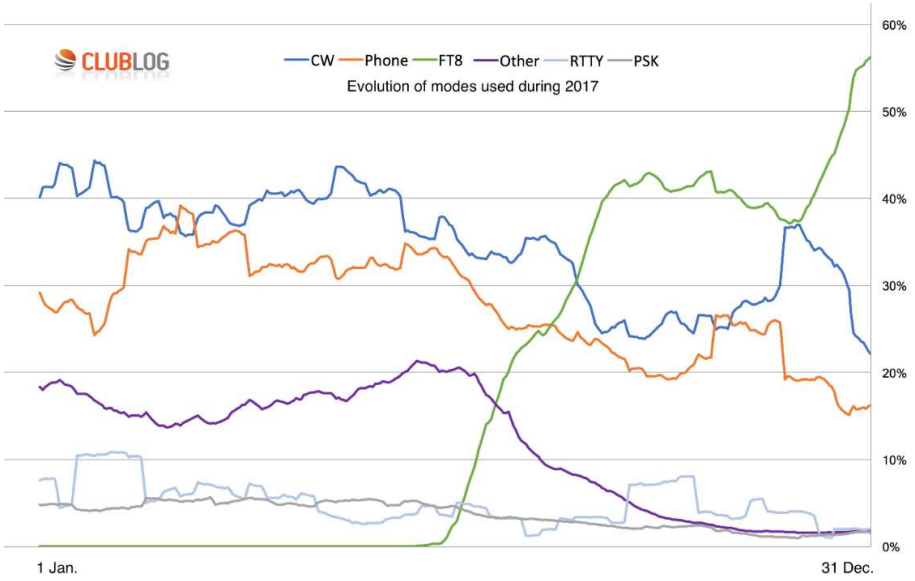

FIGURE 1 - MODE UTILIZATION DURING 2017

We do not have more recent data, but we expect that digital contacts now account for far more than 60% of all contacts. Data from 2018 shows that 60% of the contacts are made using only 20% of the spectrum. Even allowing for the narrower bandwidth of the digital signals, it appears that a re-balancing of the spectrum is in order. Such an effort should consider harmonizing mode segments with other countries. This effort likely would take years to conclude – during which time innovation in digital modes would continue to be impeded.

3) **Modify § 97.221 to allow ACDS to use more of the digital sub-band in each HF band.** Figure 2 illustrates the contention for the limited ACDS spectrum. There is significant demand for ACDS channel time in the 80, 40, 30, and 20 meter bands. The band with the most ACDS

[17] https://www.arrl.org/news/mode-usage-evaluation-2017-was-the-year-when-digital-modes-changed-forever

utilization, 40 meters, has the least amount of spectrum available, a scant 5 kHz.

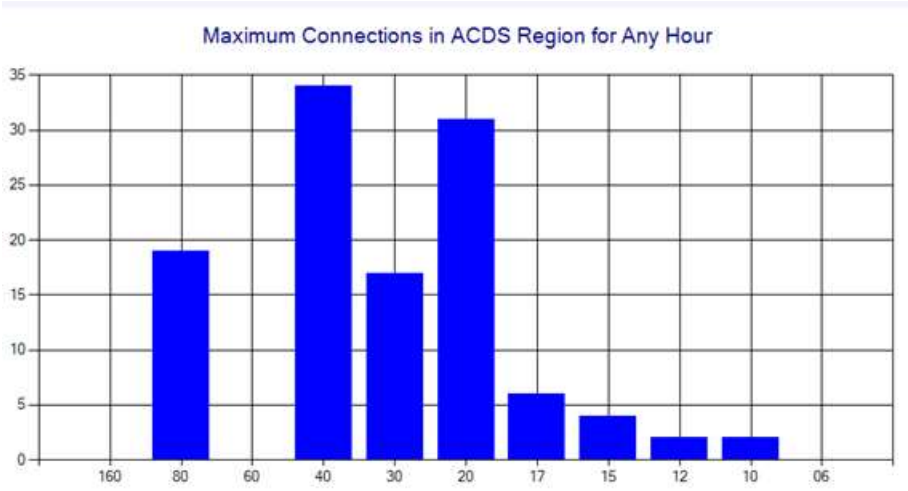

FIGURE 2 - ACDS SPECTRUM UTILIZATION, BY BAND[18]

We propose to expand the sub-bands in which ACDS are permitted to operate by not less than the amounts shown in Table 2.

Present		**Proposed**	
ACDS Sub-band (kHz)	ACDS Sub-band size (kHz)	ACDS Sub-band (kHz)	ACDS Sub-band size (kHz)
3585-3600	15	3550-3570, 3585-3600	35
7100-7105	5	7090-7115	25
10140-10150	10	10135-10150	15
14095-14099.5, 14100.5-14112	16	14090-14099.5, 14100.5-14122	31
18105-18110*	5	18085-18110	25
21090-21100*	10	21090-21125	35
24925-24930*	5	24910-24930	20
28120-28189*	69	28120-21200	80

TABLE 2 - PRESENT AND PROPOSED ACDS SUB-BANDS

*Less useful for Winlink ACDS.

[18] Source: Winlink system data collected between March 28 and April 2, 2025.

Recommendation

Solution #1 is the simplest and could adapt to future changes in technology without time-consuming rulemaking procedures but relies on compliance with voluntary band plans for which there is no guarantee that an appropriate balance would be made .

Solution #2 would re-balance the allocation of digital versus voice spectrum for current usage but likely would need to be rebalanced in the future as usage technology changes.

We recommend our solution #3 as the timeliest solution with the least impact on other users of the amateur spectrum. This would be achieved by modifying the frequency ranges available to automatically controlled digital stations (ACDS) occupying a bandwidth greater than 500 Hz in § 97.221(b) of the Commission's rules to not less than those shown in Table 2.

Respectfully submitted,

/s/ Paul C. Steinhardt, Esq.
for the
Amateur Radio Safety Foundation, Inc.

Appendix I

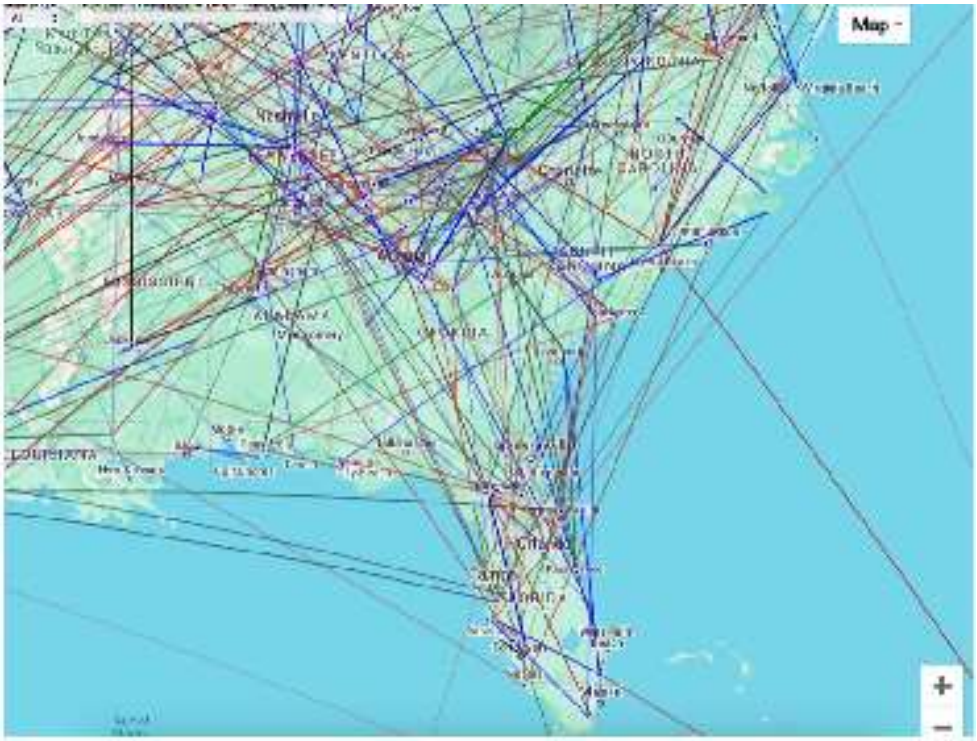

FIGURE 3 - WINLINK ACDS CONNECTIVITY FOR THE 24 HOURS FOLLOWING HURRICANE HELENE

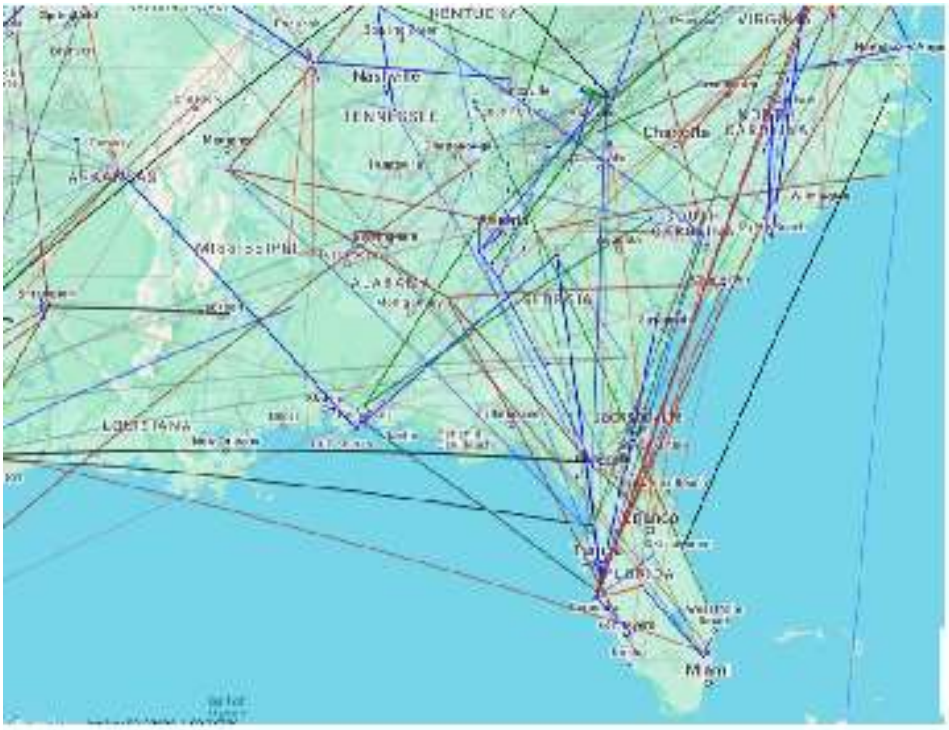

FIGURE 4 - WINLINK ACDS CONNECTIVITY FOR THE 24 HOURS FOLLOWING HURRICANE MILTON

Source: real-time connection data captured at https://winlink.org on the date indicated.

Appendix II

Excerpts from the reply comments of the Department of Homeland Security's National Coordinating Center for Communications in the matter of "Response Efforts Undertaken During the 2017 Hurricane Season"[19], PS Docket No. 17-344

Page 2:
Experimentation, or "advancement of the radio art" as it is described in the Basis and Purpose of the amateur service rules, is another aspect of amateur radio that makes it invaluable to government emergency communications. Amateur radio experimenters have developed modes of digital communications that have pushed the frontiers of weak-signal detection, waveforms optimized for various propagation and interference conditions, bandwidths, and throughput rates, error correction / error detection etc. The culture of amateur radio encourages the open exchange of information about such experiments, as well as mentoring and technical assistance to help others master these new techniques or to simply enjoy the benefits of technological advancement.

It is not so much the depth of experience that a particular individual has, but the breadth of experience common among amateur radio operators, that makes amateurs invaluable in emergency communications responses. Other commenters have documented hurricane response activities by amateur radio operators using amateur radio spectrum. We call attention to the value of the application of the skills developed in the amateur service as applied to other radio services. We agree with commenter Mark Braunstein who stated, "I would encourage the FCC to view amateur radio as a learning platform for radio technology as well as an alternate means of communications should the primary means of communication fail." Technologies developed as amateur radio experimentation, and skills applying those technologies practiced in amateur radio, were extensively utilized on federal government fixed service channels. As an example, we cite the Winlink Global Radio Email system ("Winlink"). Experience gained in the amateur service using Winlink software is put to use in a Winlink network operated on federal government frequencies. Without the extensive research and development done by amateurs, sufficient expertise would not exist to maintain and operate the SHARES Winlink network. SHARES operators using Winlink and the Pactor 3 protocol on amateur spectrum and the Pactor 4 protocol on federal government spectrum observed that while much of the time voice signals were undetectable on the channels in use, Pactor 3 and Pactor 4 data communications were able to get through.

Page 4:
Q.: Going forward, should efforts be made to increase the use of amateur radio services in connection with the planning, testing and provision of emergency response and recovery communications?

A.: We ask the Commission to review those aspects of Part 97 of their rules relating to emergency communications, including operational and technical restrictions which limit utilization of new technologies.

[19] https://www.fcc.gov/ecfs/document/102221867611691/1